INSTRUCTION MANUAL

MODEL 301

AC MICROAMMETER

FOR SERIAL # _____

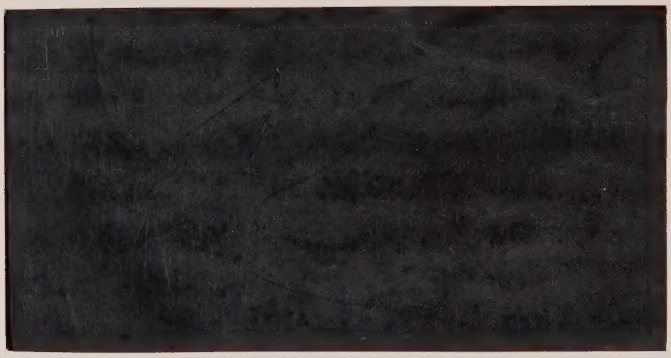
QT

• ELECTRONIC INSTRUMENTS

Quan-Tech

LABORATORIES INC.

WHIPPANY, N. J.



INSTRUCTION MANUAL

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AC MICROAMMETER

FOR SERIAL # _____

QUAN-TECH LABORATORIES

43 SOUTH JEFFERSON ROAD WHIPPANY, NEW JERSEY 07981

201-887-5508

CLAIM FOR DAMAGE IN SHIPMENT

The instrument should be tested as soon as it is received. If it fails to operate properly, or is damaged in any way, a claim should be filed with the carrier. A full report of the damage should be obtained by the claim agent, and this report should be forwarded to us. We will then advise you of the disposition to be made of the equipment and arrange for repair or replacement. Include model number and serial number when referring to this instrument for any reason.

WARRANTY

Quan-Tech Laboratories, Inc. warrants each instrument manufactured by them to be free from defects in material and workmanship. Our liability under this warranty is limited to servicing or adjusting any instrument returned to the factory for that purpose and to replace any defective parts thereof. Electronic tubes and batteries are specifically excluded from any liability. This warranty is effective for one year after delivery to the original purchaser when the instrument is returned, transportation charges prepaid by the original purchaser, and when upon our examination it is disclosed to our satisfaction to be defective. If the fault has been caused by misadjustments, misuse, or abnormal conditions of operation, repairs will be billed at cost. In this case, an estimate will be submitted before the work is started.

Calibration checks of this instrument can easily be made in accordance with the instruction manual. Routine readjustments should never be attempted. If, however, the instrument has been damaged and requires recalibration or alignment, explicit calibration procedures as defined in the instruction manual must be followed.

If any fault develops, the following steps should be taken:

1. Notify us, giving full details of the difficulty, and include the model number and serial number. On receipt of this information, we will give you service data or shipping instructions.

2. On receipt of shipping instructions, forward the instrument prepaid, to the factory. If requested, an estimate of the charges will be made before the work begins provided the instrument is not covered by the warranty.

SHIPPING

The instruments should be packed in their original containers, or in a strong exterior container and surrounded by two inches of shock absorbing material.

MODEL 301 MICROAMMETER

GENERAL

The Quan-Tech Model 301 Microammeter is designed for Current measurement of transistor circuits, magnetic amplifiers, small servo systems, and other similar networks. Its low input impedance and extreme sensitivity make low level current measurement possible without affecting the circuit under test.

Two input probes are provided:

1. A clamp-on probe, which enables quick measurements to be made of currents within the range of 300 microamperes to 100 milliamperes without disconnecting leads in the circuit under test.

2. An insertion probe, which provides for greatest accuracy of measurement over wide current and frequency ranges and with greatest sensitivity (3 microampere full scale meter reading).

SPECIFICATIONS

Sensitivity
With insertion probe, 3 ua to 100 ma full scale.
With clamp-on probe, 300 ua to 100 ma full scale.

Accuracy
With insertion probe, ±2% of full scale at 1 KC.
With clamp-on probe, ±5% of full scale at 1 KC.

Frequency
With insertion probe, flat within ±2%, 50 cycles to 100 KC, -3 db at 10 cycles and 1 MC.
With clamp-on probe, ±5%, 100 cycles to 100 KC, -3 db at 50 cycles and 1 MC.

Input Impedance
2 ohms plus 8 uh, 60 mmf to ground on ranges 3 ua through 1 ma. Negligible impedance and capacitance on ranges 300 ua and 100 ma.

Oscilloscope Connection
0.1 volt into 10 K ohms.

CONTROLS AND INDICATORS The controls and indicators comprise:

1. A power input cord with integral plug which is permanently attached to the instrument at the back.

2. The power switch which is provided with a pilot indicator.

3. The meter range switch which is directly below the meter.

4. The connector for attaching either one of the two probes.

5. An output jack for the connection of oscilloscope or other external instrument.

OPERATION To use Quan-Tech Model 301 Microammeter, proceed as follows:

1. With power switch at OFF, plug power cord into 115-volt, 60-cycle supply.

2. Turn meter multiplier control to 1000.

3. Turn power switch to ON.

NOTE. Although this instrument is completely transistorized, a daily warm-up period of a few minutes is required. If the instrument has not been used for several days, the warm-up period should be extended to 15 minutes. This enables the electrlytic capacitors to reduce their noise by reforming.

4. Select one of the two probes and connect it to the front panel. As a guide for the selection and use of the probes see "Operational Notes" below.

5. Connect the probe to the circuit under test.

6. If meter indication is very small, turn meter multiplier switch to lower value until meter indication comes to mid-scale or above.

OPERATIONAL NOTES

For quickest and easiest measurements, within the range of 300 ua to 100 ma, use the clamp-on probe. This probe is carefully constructed of high permeable magnetic material and the mating surfaces are lapped to insure minimum leakage. This probe forms a transformer having a turns ratio of 1 to 100 when clamped around a wire.

> CAUTION. Although this probe is built as ruggedly as its nature permits, it should be handled with care to avoid damage to or distortion of the mating surfaces. A thin film of light lubricating oil should be applied to the lapped surface from time to time.

For greater sensitivity and accuracy, use the insertion probe. This probe is a current transformer enclosed in a mu metal shield to eliminate stray magnetic pick-up. It has two turn ratios; 1 to 1 and 1 to 100. The 1 to 1 ratio permits measurements down to 3 ua full scale with a noise level less than 0.1 ua.

Care should be taken to avoid excessive currents applied to the probes. When the instrument is adjusted in the range of 300 ua to 100 ma not more than 500 ma DC should be applied. With the insertion probe and in the 3 ua to 1 ma range the DC current should not exceed 10 ma. Larger currents will result in a decrease in the low frequency response and possible distortion. Extremely large currents may destroy the windings in the insertion probe.

Since there is some feed-thru capacity in the probe, it should be used on the low side of high impedance circuits at high frequencies.

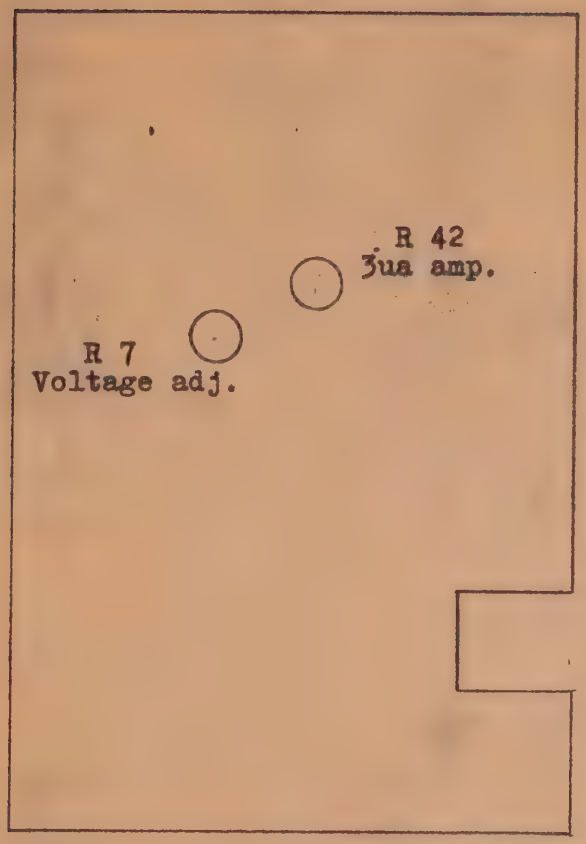
Note that each probe is marked with a polarizing dot indicating the positive terminal to give a positive voltage at the output monitor.

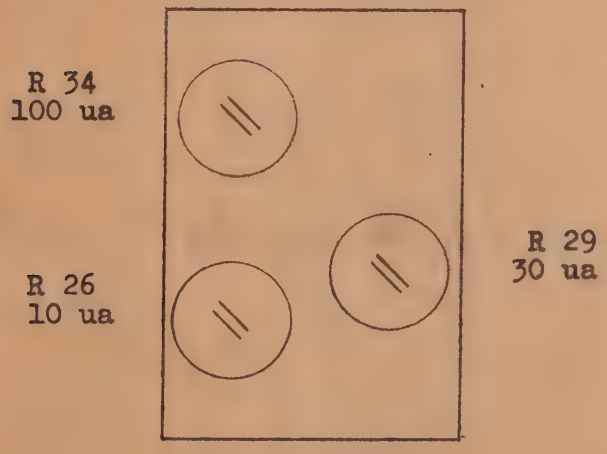
This instrument is of the averaging type, calibrated in rms volts for pure sine wave. Allowances must be made for other waveforms.

It should be noted that there is no capacity coupling within this instrument. Consequently, if the input terminals are employed for anything other than the probes furnished with the instrument, DC should not be applied.

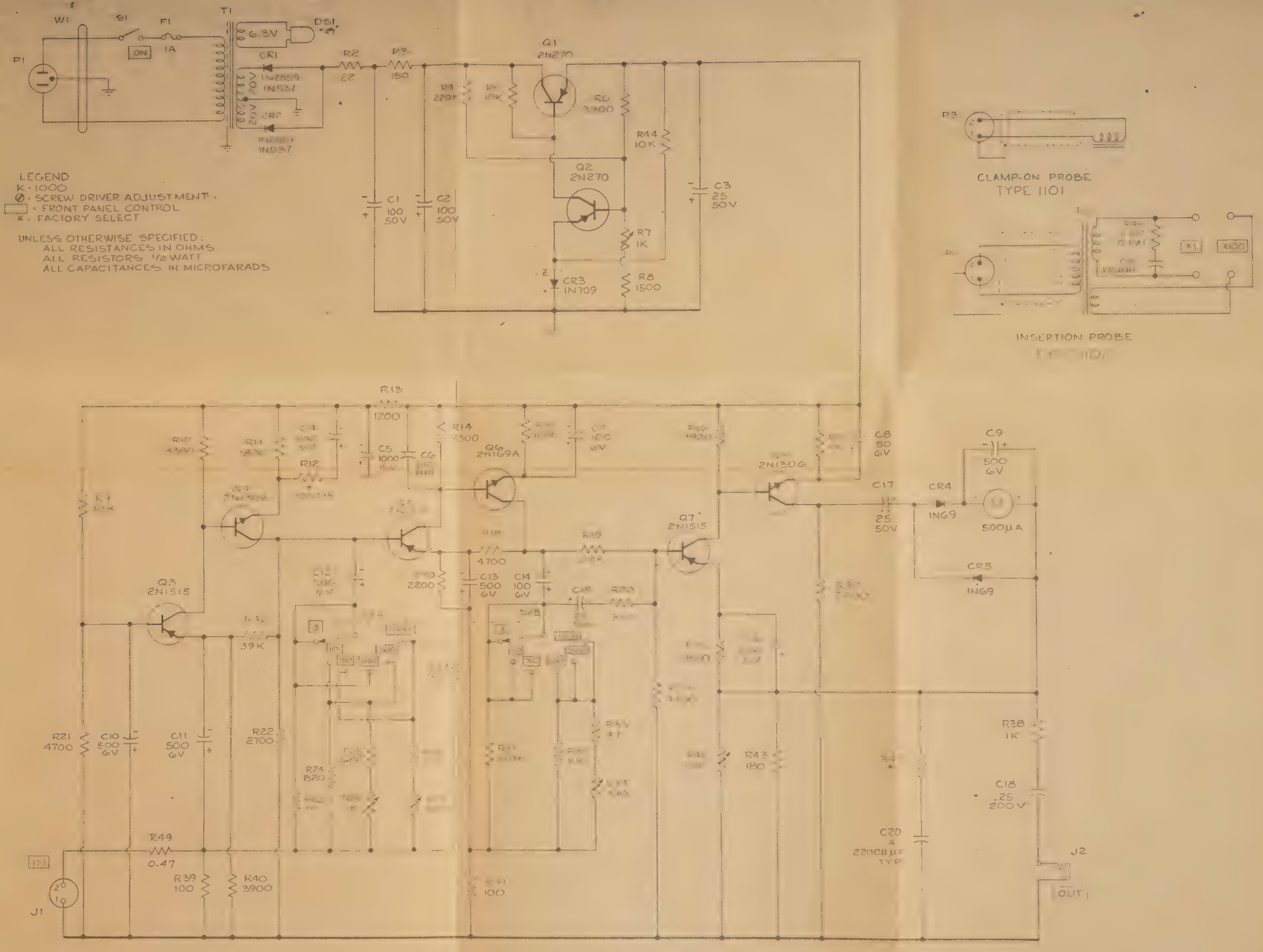
THEORY

Quan-Tech Model 301 Microammeter consists of six transistor stages having a large amount of negative feedback around each amplifier pair. A grounded base input and a feedback factor of nearly unity from the second stage gives an input impedance of approximately 1 ohm and unity current gain. The amplifier pair comprising Q5 and Q6 is a gain stage. The final pair contains the metering circuit. Linearity is achieved by current feedback through the meter and diodes. An output monitor is provided from the feedback resistor in the final stage. A series resistance of 1K ohms and a blocking condenser protect the circuit from severe loading by the monitor. Additional stability and freedom from line transients is obtained from the regulated power supply.





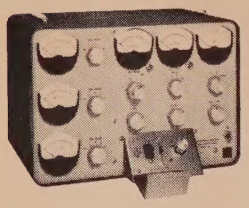
Calibration adjustments



SCHEMATIC
A.C. MICROAMMETER
MODEL 301

C-1059- U

Quan-Tech INSTRUMENTS



MODEL 310 TRANSISTOR NOISE ANALYZER

Measures noise current and voltage at 100 cps, 1 Kc and 10 Kc, as well as I_{cbo}, I_{ebo} and beta. **Noise voltage range:** 0.01 to 3 μv/root cycle, FS. **Noise current range:** 1 to 300 pa/root cycle, FS. **Collector current range:** 0.05 to 30 ma. **Collector voltage range:** 0.1 to 30 v. Measuring system automatically corrects for transistor-gain variations. **Price:** $2375

MODEL 311 TRANSISTOR NOISE ANALYZER

Similar to above, except that collector current range is from 5 to 1000 μa for noise measurement in low-collector-current devices. Beta measurement not provided. **Price:** $2575.

MODEL 312 TRANSISTOR NOISE ANALYZER

Similar to Model 310, but designed for measurement of field-effect transistors. **Drain voltage range:** 0.1 to 30 v. **Drain current range:** 0.05 to 30 ma. **Gate Bias range:** 1 v forward to 15 v reverse, continuously adjustable. Also measures transconductance. **Price:** $2575

MODEL 315 RESISTOR NOISE TEST SET

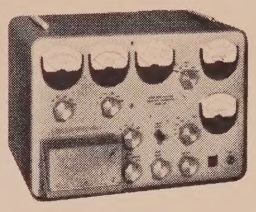
Measures noise in resistors in conformance with specifications recommended by NBS and Method 308 of MIL STD 202B. **Test-resistor range:** 100Ω to 22 meg Ω. **Measurement range:** 0.6 μv in a decade to 1000 μv in a decade. **Outputs:** Sample of noise voltage; analogs of meter readings. External cable supplied for remote location of test jig. **Price:** $1950

MODEL 2136

Similar to above, but measures resistors down to 10 Ω. **Price:** $2300

SPECIAL MODIFICATIONS

The specifications for instruments shown here are those which experience has shown meet the needs of the great majority of applications. However, in cases where highly specialized functions require variations of these characteristics, custom modifications are frequently feasible. For information on Special Modifications, write, outlining your requirements to the address below.

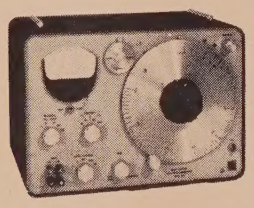


MODEL 327 DIODE NOISE ANALYZER

Measures noise in back-biased semi-conductor diodes at 10 cps and 1 Kc simultaneously. **Noise voltage range:** 0.03 μv to 1 mv/cycle of bandwidth. **Test voltage:** 0 to 500v, continuously variable. **Test current:** 0 to 100 ma, continuously variable. Internally supplied ramp automatically sweeps test current and/or voltage within maximum ratings. A wide variety of outputs for data logging, external monitoring, actuating external equipment, etc. **Price:** $2750

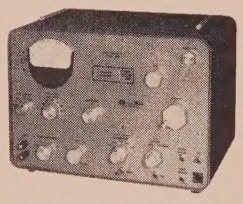
AUTOMATED NOISE TESTING

Designs exist for automatic and semi-automatic production noise-testing of resistors, diodes, transistors and capacitors. For information, write stating your particular requirements, to the address below.



MODEL 303 WAVE AND NOISE SPECTRUM ANALYZER

Frequency range: 30 cps to 100 Kc. **Bandpasses:** 10, 30, 100, 1000 cps, selectable at front panel. (100 and 1000 cps bandwidths flat-topped for simplified noise computation, greater accuracy and convenient tuning. **Sensitivity:** 100 μv to 300 v, FS. Down to 1 μv FS with accessory Model 203 preamplifier (see below). $\pm$300 cps vernier; selection of long or short meter time constants; metering circuits compensated to minimize error from instantaneous noise pulses; overload-protected meter; analog output for external monitoring. **Price:** $1475



MODEL 304 LOW FREQUENCY WAVE & SPECTRUM ANALYZER

Frequency range: 1 cps to 5 Kc; **Bandpasses:** 1, 10 & 100 cps, selectable at front panel; **Skirt Selectivity:** 24 DB per 1/2 bandwidth; **Voltage range:** 10 μv to 100 v, FS; down to 1 μv FS with accessory Model 201B preamplifier (see below); **Tuning:** Manual or automatic; Internally supplied electronic sweep of total frequency range or of any portion; provision for external sweep; **Frequency Calibration:** Linear; **Outputs:** BFO, sample of automatic sweep, analogs of meter readings and frequency setting, phase output for phase plot on X-Y recorder. **Price:** $2350

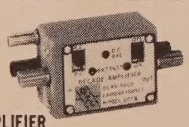
MODEL 420 RANDOM NOISE GENERATOR

Stable "white" noise output having true gaussian amplitude distribution. **Frequency range:** dc to 100 Kc; **Output voltage:** 0.01 to 1000 μv/root cycle, continuously variable, calibrated; **DC offset:** less than 10 mv at max. output. **Price:** $525

MODEL 317 AMPLITUDE DISTRIBUTION ANALYZER

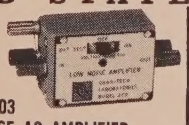
Determines amplitude-probability distribution of random signals. **Amplifier response:** 3 db down at approx. 12 cps and 1 Mc; **Switching rate:** 5 Mc; **Amplitude ranges:** 100%, 10%, 1% FS; Normal or "inverted" operation; provision for external sweep of level. **Price:** $450

SOLID STATE AMPLIFIERS



MODEL 201B DC DECADE AMPLIFIER AC OR DC COUPLED

Bandwidth: DC or 10$\approx$ to 3Mc (3db); **Gain:** 10 (fixed); Power: Self-contained batteries; **Price:** $110



MODEL 203 LOW NOISE AC AMPLIFIER

Bandwidth: 30 cps to 100 Kc ($\pm$0.5 db); —3 db at 500 Kc; **Gain:** 100 (fixed); **Typical noise:** 5 x 10^{-9} v and 3 x 10^{-12} a per root cycle at 1 Kc. Battery powered; **Price:** $125

MODEL 205 HIGH-STABILITY DC AMPLIFIER

Bandwidth: dc to 100 Kc (0.5 db down); 3 db down at approx. 500 Kc; **Gain:** 10 (fixed); **Typical drift:** less than 250 μv at constant ambient, input shorted. External + & — 12 v required. **Price:** $105

MODEL 206 SELECTABLE GAIN AC AMPLIFIER

Bandwidth: 10 cps to 100 kc (within 0.5db); —3db at 500 Kc. **Typical noise:** 5 x 10^{-9} v and 3 x 10^{-12} a per root cycle at 1 Kc. **Gain:** 10, 100 & 1000, selectable at front panel; **Power:** 105-125 v AC or optional self-contained battery pack (automatically recharging). **Price:** $165, Batteries $25.

All prices shown are F.O.B. Boonton, N. J. Prices and specifications subject to change without notice.

Quan-Tech LABORATORIES, INC.

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